

REMARKS

Reconsideration of the application is requested in view of the above amendments and the following remarks. A one (1) month Petition For Extension of Time is filed concurrently herewith. Therefore, the time period for reply extends up to and includes July 26, 2007. Applicant wishes to thank the Examiner for her careful review and consideration of the present application. Applicant also thanks the Examiner for the indication that claims 9 and 10 are allowed, and that claims 5 and 7 would be allowable if rewritten in independent form.

Applicant has amended claims 1 and 2 and has added new claim 11 above. No new matter has been entered and such amendments are fully supported by the specification, drawings and claims as originally filed. For example, the single-variable equation for calculating both aortic and pulmonary cross-sectional area can be found at page 7, lines 12-16, where the single variable is "ht" (height). Claims 1-5, 7, and 9-11 remain pending in the present application.

Claim Objections

In the subject action, claim 2 was objected to because of an informality. Applicant has amended claim 2 to depend on new claim 11, to change "the patient's height" to --an individual's height-- and has deleted the phrase "to provide the correlation data". Applicant requests that the objection to claim 2 be withdrawn.

Claim Rejections Under 35 § 102

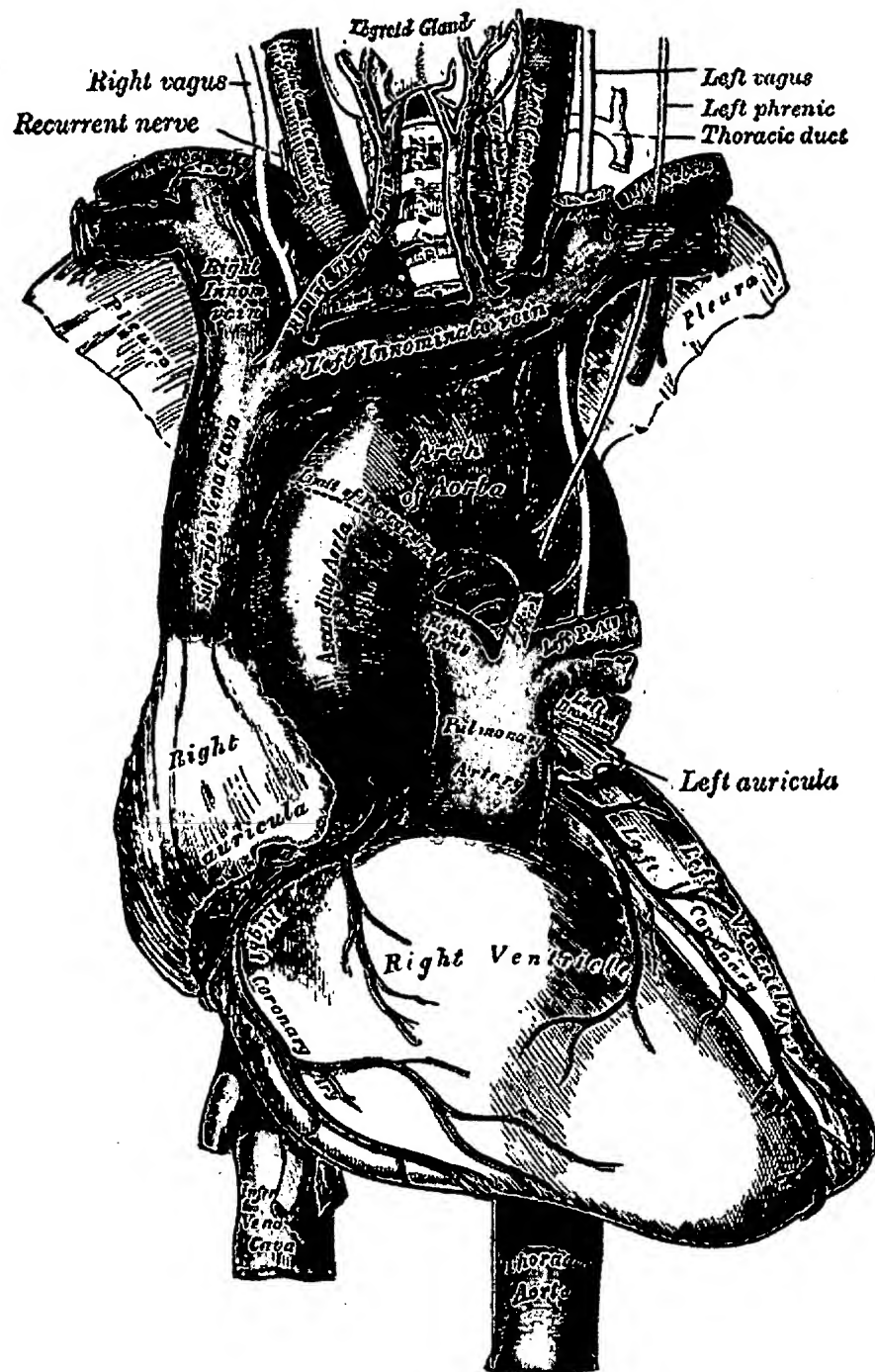
At paragraph 4 of the subject Action, claims 1-4 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,052,395 (Burton). Applicant respectfully traverses the rejections.

First, claim 1 has been amended to recite that the method of determining cardiac output of a patient comprises a step of calculating an estimate for the cross-sectional area of the heart based on a *single variable* formula, wherein the single variable is the *patient's height*. In addition, new claim 11 has been added to recite that the *single variable* formula is responsive to

correlation data for estimating cross sectional area of the heart of the patient based on the *patient's height*. It is submitted that Burton does not disclose these limitations.

The Examiner identified that Burton estimated the diameter and cross sectional area of the ascending aorta using correlation data (Col. 17, line 59 and Col. 18 line 17). The arrangement in Burton discloses a device that calculates a patient's blood flow through the ascending aorta from "the Doppler measured velocity combined with an aortic diameter estimation made from the patient's height, weight and age" (Abstract). The correlation data and equation disclosed by Burton requires *each* of the patient's *height*, *weight* and *age* and the measuring of the velocity time integral or stroke distance of blood flowing through the ascending aorta of the patient (Col. 18 lines 3 to 19). By contrast, claim 1 of the present application is directed at a method comprising the step of "calculating an estimate for the cross sectional area of the heart valve based on a *single variable formula*; wherein the single variable is the *patient's height*". Thus, whereas claim 1 of the present application recites a calculation based on the single variable of a patient's height, Burton discloses a calculation based on multiple variables - the patient's *weight* and *age* in addition to the patient's height. Therefore, Burton does not disclose the limitation of calculating an estimate for the cross sectional area of the heart based on a *single variable formula* where the single variable is the patient's height, as recited in claim 1 of the present application.

Second, Burton derives a measure of blood flowing in the ascending aorta (Col. 2 line 40, and Claim 1), in part, by estimating the diameter of the ascending aorta (Col. 18 lines 3 to 19). It should be noted that the ascending aorta is an artery that pulses during a cardiac cycle due to it having an elastic wall structure, and its diameter can vary up to 15% during this cycle. This can further influence the measurement by the pulse Doppler ultrasound of blood velocity at different depths in the ascending aorta of a patient (Col. 2 line 43 and 44). As shown in the attached drawing, the ascending aorta has a left coronary artery and a right coronary artery separating from the ascending aorta proximal to the aortic valve. If blood flow is measured in the ascending aorta beyond these points of separation, the flow contained within these arteries is not measured, and therefore not included in the corresponding measure of cardiac output.



This reproduction is of a lithograph plate from Gray's Anatomy, 20th U.S. edition of Gray's Anatomy of the Human Body, originally published in 1918, and is believed to be an accurate copy.

Therefore, the Applicant's method is distinguished from that taught by Burton as it provides an estimate of cardiac output calculated from a measured blood flow across a heart valve (page 4 lines 15 and 16) as distinct from measured blood flow in the ascending aorta. This method also involves a corresponding estimate for the diameter and cross sectional area of a heart valve, as distinct from the ascending aorta. These limitations, not disclosed in Burton, are recited in claim 1 of the present application.

Third, the heart valve diameter and cross sectional area, which is a relatively less changeable over a cardiac cycle, is estimated from the *height of the patient alone* (page 7 lines 12 to 16), as distinct from the three variables (height, weight and age) required by Burton. In the presently claimed invention the Applicant teaches a method of deriving cardiac output by calculating an estimate for the cross sectional area of the heart valve based on a single variable formula using the patient's height and calculating a value for the cardiac output of the patient as a product of the measured blood flow and the estimated cross sectional area of the heart valve. Applicant respectfully asserts that there is a clear distinction between the present invention and the invention taught by Burton.

Fourth, it should be further appreciated that the height of a patient is typically more readily obtainable than weight and age, particularly when the patient is unconscious. Measuring cardiac output by estimating the diameter or cross sectional area of a heart valve and measuring the blood flow across the heart valve enables a more desirable result as it is less affected by change in diameter over a cardiac cycle.

Fifth, by measuring the blood flow across the aortic valve, the blood flow contained within the left coronary artery and a right coronary artery is included to provide a complete measure of cardiac output. Therefore, the development and corresponding incorporation of the estimate of the cross sectional area of the heart valve when combined with measure of the blood flowing across the heart valve provides a synergistic result when deriving cardiac output by providing further improvements in comparison with the device taught by Burton.

Sixth, the correlation function recited in claims 2 and 11 of the present application is not disclosed by Burton. Burton discloses a formula that produces a correlation based on three variables - a patient's height, weight and age (Col. 18, lines 3 to 19) whereas claims 2 and 11 of the present application disclose a correlation based on a patient's height alone.

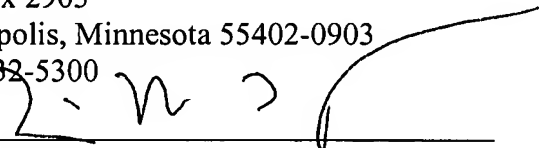
In view of the foregoing, reconsideration and withdrawal of the § 102(b) rejections to claims 1 and 2 is requested. Since claims 3 and 4 depend from claim 1, Applicant submits that these claims are also allowable and requests reconsideration and withdrawal of the § 102(b) rejections to claims 3 and 4. Furthermore, since claims 5, 7 and new claim 11 all depend from claim 1, Applicant submits that claims 5, 7 and 11 are also allowable. Applicant does not otherwise concede the correctness of the rejections and reserves the right to make additional arguments as may be necessary.

In summary, Applicant requests reconsideration of the application in the form of a Notice of Allowance. If a phone conference would be helpful in resolving any further issues related to this matter, please contact Applicant's attorney at (612) 336-4755.

Respectfully submitted,

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